



Monitoring Subalpine Butterflies as Climate Changes

Introduction

Butterflies and plants are sensitive indicators of climate change because air temperature influences their life cycles and their geographic distribution. As butterflies develop from egg to larvae to pupae and finally to full maturation, temperature thresholds may trigger these changes. Plant budburst, flowering, and fruiting times are also influenced by temperature and precipitation. Butterflies depend on plants as host plants – providing nectar or shelter for eggs and developing larvae.

Climate models project warmer summers, earlier snowmelt, more frequent forest fires, and changes in distributions of plants and animals, but not details on how species in our area will respond to these conditions. Studies in Europe and California have documented range shifts in butterflies in response to changing temperatures. Some species have moved northward or to higher elevations to track their optimal temperature range.

We are monitoring butterflies and plant phenology to understand how species in our parks are being influenced by warmer climates.

What Are We Doing?

We are monitoring butterfly abundance and plant phenology at ten permanent survey sites in two national parks and two national forests:

- North Cascades National Park Service Complex
- Mount Rainier National Park
- Mount Baker-Snoqualmie National Forest
- Okanogan-Wenatchee National Forest

Monitoring Objectives

1. Monitor long-term trends in butterfly species richness and population abundance in select areas
2. Monitor long-term trends in plant phenology
3. Engage citizen scientists in collection of data and communication of information to the general public
4. Provide field science internship opportunities to young scientists
5. Provide data to national parks and forests to inform and adapt land management practices as climate changes

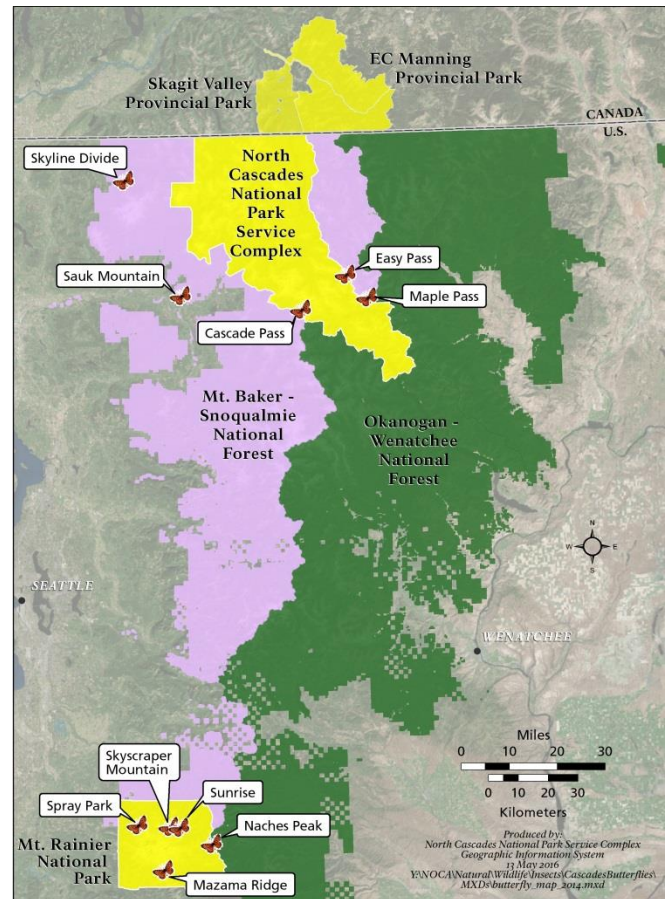


Figure 1. Map of survey sites

Monitoring Methods

- Butterfly abundance and plant phenology is monitored along ten 1-kilometer survey routes in 2 national parks and 2 national forests
- Monitoring is conducted weekly from snow-melt (~early July) until the first frost (~early September)
- Butterfly abundances are monitored using the Pollard Walk method
- Butterfly data are stored in partnership with the North American Butterfly Monitoring Network's Pollard Base database (NABA) and Butterflies and Moths of North America (mp.butterfliesandmoths.org)

Results - Butterflies

Each year we have completed more surveys and documented more species with our volunteers and interns.

Table 1. Summary of number of surveys, species documented, and butterflies from 2011 - 2015

Year	# Surveys	# Species	# Butterflies
2011	29	23	819
2012	29	21	480
2013	34	21	1,585
2014	66	30	2,519
2015	100	36	4,431

In 2015, snow melt was about 3 weeks early and we found that both butterfly abundances and plant flowering times also peaked earlier in the summer.

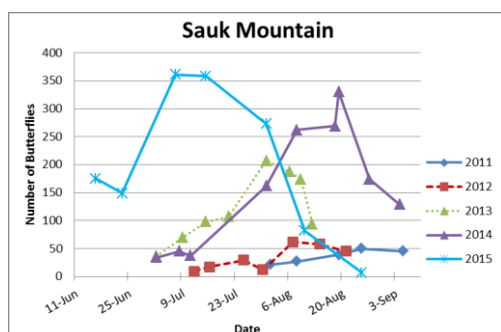


Figure 2. Butterfly abundances on Sauk Mountain, 2011- 2015

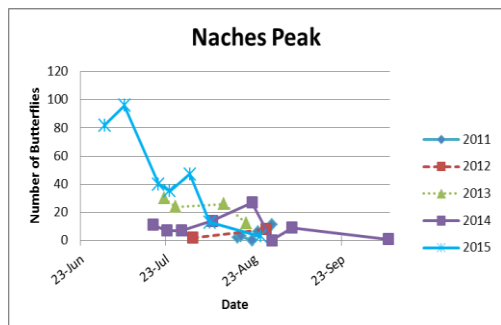
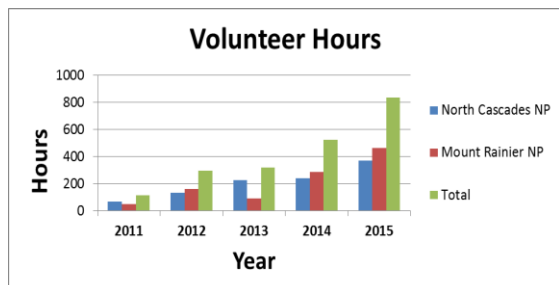


Figure 3. Butterfly abundances on Naches Peak, 2011- 2015

Results – Volunteer Involvement

Our program started in 2011 and our volunteer corps is growing allowing us to survey sites more frequently.



2016 Field Crew

North Cascades National Park Service Complex



Tanner Humphries is the Field Lead for North Cascades. Tanner has worked with the Cascades Butterfly Project (CBP) since 2013. He graduated from Western Washington Univ. in 2013.



Salvador (Eddie) Silahua graduated with a B.S. from Humboldt State University in 2015. This is his first season with the CBP and first season as a Biological Technician with the NPS. He has completed two internships as a Prairie Restoration Intern at San Juan Island National Historic Park



Michelle Wong is a senior in Biology at California Polytechnic State University. She is an intern with the NPS "Mosaics in Science Program"; this is her first season with the CBP.

Mount Rainier National Park



Ana Casillas is the Field Lead for Mount Rainier National Park. She has a MSc from Bangor University (Wales) in 2013 and a BA from Evergreen State University. This is her first season with the CBP, but she has worked in North Cascades, Shenandoah and Acadia National Parks.



Katherine (Kathy) Acosta just graduated from Stevenson University (MD) with a BS in Biology. She is an intern with the NPS and Geologic Society "GeoScience in the Parks" program and this is her first season with the CBP.



More Information

Regina M. Rochefort, Ph.D.
North Cascades National Park
Service Complex
Email: regina_rochefort@nps.gov
Phone: 360-854-7202